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CIRCULAR No. 318 JULY 1934
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C.

A NEW METHOD OF SELF-POLLINATING COTTON

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INTRODUCTION

The progress of cotton-breeding investigations often is limited by the amount of self-pollinated seed that can be obtained with available time and labor. A new method of obtaining self-pollinated seed has been developed and tested at the United States Acclimatization Field Station near Charleston, S.C. This method is much more rapid and equally or more effective than methods formerly used.

FORMER METHODS OF SELFING COTTON

Two methods of self-pollinating cotton have been in general use. One consists of fastening the tip of the corolla with a rubber band or wire clip. This procedure is rapid and is reasonably safe for purposes which do not require the utmost certainty of protection against cross-pollination. There are, however, two objections that limit its usefulness. Owing to the relation of floral parts in the bud the tip of the corolla must not be fastened too soon. If the band or clip is applied before the corolla has fully elongated just before opening, the stigma and staminal column may be included within the fastener and pollination thereby hindered or prevented. Since this method cannot be used safely until the bud has approached its maximum size, selfing cannot be done the afternoon preceding flower opening, but is limited to a few hours in the morning immediately before the bud begins to open. A more serious objection, in cases requiring the greatest certainty of protection from cross-pollination, arises from the fact that the banded or clipped flowers are difficult to find on the day following pollination and must be indicated by tags at the time the fastener is applied. An occasional fastener may slip off before pollination is completed, thus exposing the flower to cross-pollination. When tags already have been attached to the buds there is no means of identifying those that have been exposed.

A more reliable but slower method of self-pollination consists in covering the buds with small paper bags. The bags are slit 2 or 3 inches from the top, slipped over the bud, and fastened underneath the branch with short pieces of copper wire. This can be done the afternoon preceding opening of the bud and affords practically certain protection against insect pollination. The only objection is the time required to attach the bags, several operations being in-

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volved; opening the bag, placing it over the bud, and wiring it in place. This requires an appreciable amount of time and limits the number of flowers that can be bagged within a given period.

PAPER-CONE METHOD

The paper-cone method of self-pollinating (fig. 1) upland cotton is as certainly effective as the paper-bag method and permits more than twice as many flowers to be treated in an equal period. The cones may be applied during the afternoon preceding bud opening, as with the paper bags, affording much more time for selfing than with the rubber-band method.

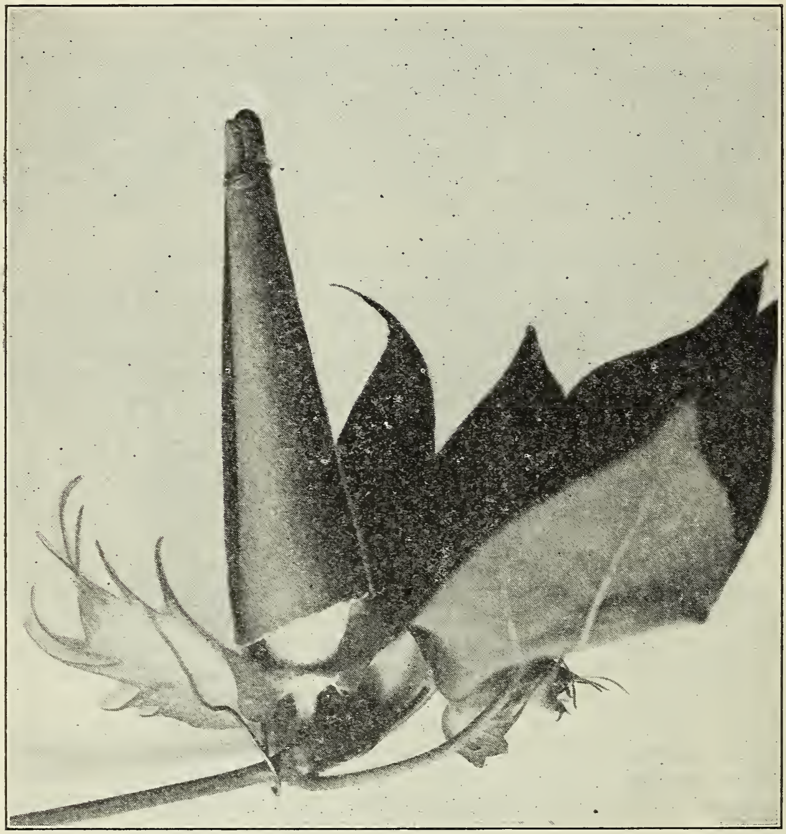

FIGURE 1.—Selfing cone in position on cotton flower (one bract removed). Note method of hooking wire under fruiting branch. (Natural size.)

The cones can be made rapidly after a little practice, as many as 150 cones having been made in 1 hour. This permits providing a considerable supply within a short time. If made from a good grade of wrapping paper having a hard finish, the cones may be used many times. The same cones have been used at the James Island station during three successive seasons and many are still in good condition.

The materials used in making the cones are illustrated in figure 2 and include the following items: Wooden peg (*A*), seven-eighths inch in diameter, shaped to a cone 3¾ inches in length with the tip having a diameter of about one-sixteenth inch. Wrapping paper (*B*) cut in the shape illustrated in figure 2. The patterns are cut from a rectangular piece 3 by 3½ inches and the two diagonal corners are cut off as indicated. Copper wire (*C*), gage 20 or 22, cut in 7½-inch lengths, and threaded through brass O.K. clips, size no. 1.

In forming the cones, the peg should be placed on the paper in the position shown in figure 2, and the paper wrapped tightly, beginning with the line *a′ b*. If the peg is correctly placed in starting the cone, the edge *a d* will form nearly a straight line from the tip to the base of the cone and the point *d* will coincide with *c*, as shown in figure 2, *D*. A strip of wire is then placed under the edge of the paper, allowing about 1½ inches to project past the tip of the cone. The tip and the enclosed wire are bent over, and the projecting end of the wire is wound tightly around the cone about one-fourth inch from the tip. A brass clip is slipped over the wire which projects below the cone and is clinched on the base of the cone.

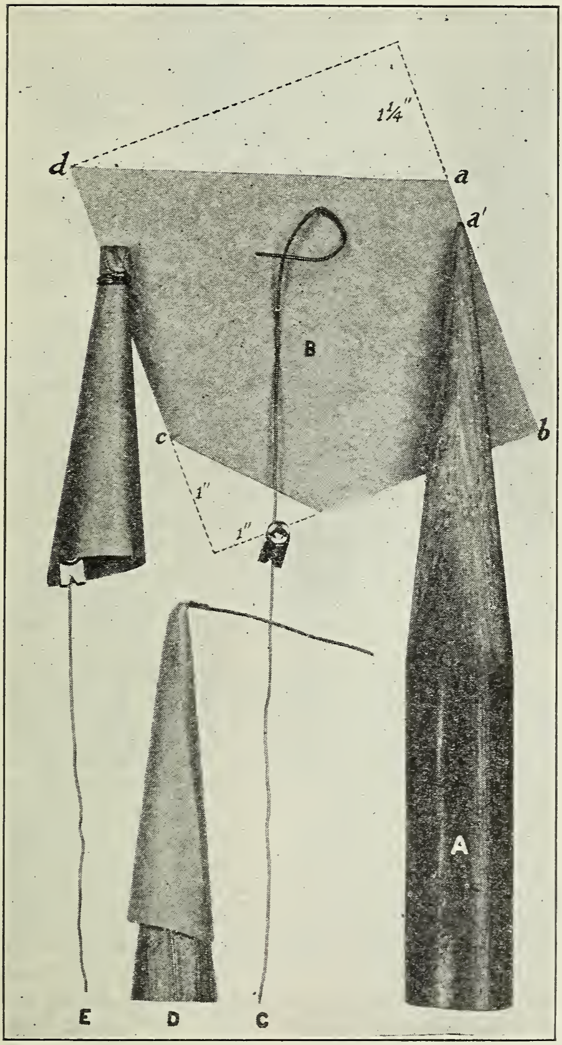

FIGURE 2.—Method of making cones: *A*, Wooden peg used in shaping the cones. The location of the peg on the pattern (*B*) shows the proper position to start rolling the cone. *B*, Paper pattern. The dotted lines indicate portions cut off to form pattern. *C*, Wire and O.K. clip. *D*, Cone with wire inserted. Note length of wire projecting past tip of cone and direction of folding. *E*, Completed cone, showing projecting wire wrapped around tip of cone and base of cone fastened with clip.

The cones may be applied as soon as the bud is 1 to 1¼ inches long. On the Sea Islands, near Charleston, S.C., they can be attached by 3 or 4 o'clock in the afternoon preceding bud opening, and also in the morning immediately before the corolla begins to open. The bracts enclosing the bud are separated, the cone is slipped over the bud, and the projecting wire bent under the fruiting branch below the bud. An attached cone is illustrated in figure 1. It is unnecessary to wrap the wire around the branch, as the cones stay in place if the wire is simply hooked under the branch.

COMPARISON OF PAPER-BAG AND PAPER-CONE METHODS

The paper-cone and paper-bag methods of self-pollination were compared during 1931. The rubber-band or clipping method was not included, as it is not considered sufficiently reliable for technical purposes.

The time required to attach a cone averaged about 5 seconds, while a bag required an average of about 15 seconds. Since an additional equal time is required to locate the buds with either method, the numbers of cones or bags that can be applied within a given time are not proportional to the actual time required for attachment. The rate of applying cones and bags was compared by having two assistants self-pollinate 50 buds by each method on successive days. In every comparison the assistant using cones selfed 50 buds by the time the one using bags had selfed 20 or 25 buds, the use of the paper cones being more than twice as fast.

In addition to the larger number of flowers that can be self-pollinated by using cones, evidence also was obtained indicating that the cones are equally as effective as, or more effective than, the bags in other ways as well. During the period from July 24 to 31, 50 flowers were self-pollinated each day by each method. The 350 flowers self-pollinated by using cones produced 112 mature bolls, while the same number of flowers self-pollinated by bagging produced only 83 mature bolls. In 80 bolls self-pollinated with cones there were 336 locks (exclusive of 21 locks damaged by weevils) containing 2,170 seeds, or an average of 6.46 seeds per lock. In 80 bolls self-pollinated by bagging there were 324 locks (exclusive of 27 injured by weevils) containing 1,951 seeds, or an average of 6.02 seeds per lock.

On the basis of these data, 350 flowers self-pollinated with cones produced a total of about 3,025 seeds, while an equal number of flowers self-pollinated by bagging produced about 2,125 seeds, representing an increase of 42.3 percent in favor of the cone method. Such a striking difference in the efficiency of the two methods might not occur under other conditions, although there was no observed evidence that conditions in this comparison favored the cone method. It is possible that the greater amount of handling necessitated in attaching and removing the paper bags may cause some injury to the buds and result in greater shedding of young bolls. On the other hand, the greater restriction of the cones against expansion of the corolla also may result in better pollination, as the uppermost anthers are pressed more closely against the stigma than where the flowers open partially as in the bags. In any event, the larger production of seed per flower selfed, in connection with the much greater speed of the cone method, resulted in these experiments in a total production of more than three times as much seed per unit of time as by bagging.

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